

on the decimal system to be formed, $n+1$ being an integer number directly greater than the division ratio of the frequency of said auxiliary control pulses by the frequency of said second control pulses.

28. The electronic timepiece according to claim 27, wherein said initialization means include a secondary counter arranged for counting m second control pulses and an initialization circuit coupled to said primary counter, said secondary counter providing a signal to said initialization circuit every m second control pulses so that said primary counter is initialized with a value k .

29. The electronic timepiece according to claim 17, wherein said auxiliary control pulses are supplied at an output of one of the binary division stages of said frequency divider circuit.

30. The electronic timepiece according to claim 17, wherein said auxiliary control pulses are supplied at an output of N^* additional binary division stages connected after said frequency divider circuit upstream of said generating means.

31. The electronic timepiece according to claim 17, wherein said generating means supply said second control pulses at a mean frequency of $1/8.64$ Hz.

32. The electronic timepiece according to claim 17, wherein said generating means supply said second control pulses at a mean frequency of $1/86.4$ Hz. --

REMARKS

With the above amendments, the specification has been amended to include additional background art known to the applicants.

All of the claims originally pending in this application, i.e., claims 1-16, have been cancelled and replaced by new claims 17-32.

Attached hereto are substitute pages 1-4a of the specification and substitute pages 20-23 of the claims. These substitute pages replace pages 1-4 of the original


specification and pages 20-23 containing the claims as originally filed. As can be seen by the marked-up copies of original pages 1-4, no new matter has been added.

In view of the above, it is believed that the application is in good formal condition for examination.

Respectfully submitted,

GRIFFIN & SZIPL, PC

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B. Franklin Griffin, Jr.
Reg. No. 19,334

GRIFFIN & SZIPL, PC
Suite PH-1
2300 Ninth Street, South
Arlington, VA 22204

Telephone: (703) 979-5700
Facsimile: (703) 979-7429
Customer No.: 24203

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ELECTRONIC TIMEPIECE INCLUDING A TIME
RELATED DATA ITEM BASED ON A DECIMAL SYSTEM

The present invention relates to an electronic timepiece allowing the display of several time related data. More particularly, the present invention relates to a timepiece allowing the display of at least a first and a second time related data item, the first time related data item being based on the Hour-Minute-Second system

5 (hereinafter H-M-S).

Electronic timepieces allowing the display of a plurality of time related data are already known in the prior art. These timepieces, commonly called « universal timepieces » are typically provided to allow the display of a time related data item representative of a universal time and one or more time related data representative of
10 local times corresponding to different time zones. This multitude of time related data can cause a risk of confusion for the user when they are read and generally requires means to be provided to allow clear identification of what each of the displayed time data refers to.

insert new § > One object of the present invention is thus to provide an electronic timepiece
15 allowing the display of at least a first and a second time related data item, by means of which the user can clearly and quickly identify and differentiate between the displayed time related data.

The present invention therefore concerns an electronic timepiece allowing the display of at least a first and a second time related data item, ~~said first time related~~
20 data item being based on the Hour-Minute-Second system, this timepiece including a time base supplying pulses to a frequency divider circuit including N binary division stages and supplying first control pulses allowing said first time related data item to be formed and displayed, this timepiece being characterised in that said second time related data item is based on a decimal system wherein time is divided at least into
25 thousandths of a day, this timepiece further including generating means arranged to supply, from auxiliary control pulses originating from said time base, second control

the features of which are recited in independent claim 1

pulses allowing said second time related data item to be formed and displayed⁷

The solution advocated by the present invention thus allows the first time related data item to be clearly differentiated from the second due to the fact that the first and second time related data items are based on different systems.

- 5 The H-M-S system conventionally used consists of dividing the day into 24 hours, 1 hour being divided into 60 minutes, and 1 minute into 60 seconds. A time division based on the decimal system on the other hand consists in dividing the day, not in accordance with the aforementioned conventional scheme, but successively, into tenths of a day (equivalent to 2.4 hours or 144 minutes), which are themselves
10 divided into hundredths of a day (equivalent to 14.4 minutes or 864 seconds), then into thousandths of a day (equivalent to 86.4 seconds) etc..

- In particular, by selecting a division of time into thousandths of a day, the second time related data item only requires three digits (« 000 » to « 999 ») to be displayed and is thus clearly distinguished from a conventional time related data item
15 based on the H-M-S system typically displayed in the format « HH:MM ». The risk of confusion during reading of the time related data is thus greatly reduced.

- The atypical format of the second time related data item proves for example particularly suitable for displaying a universal time to which the user can clearly refer without confusing it with a conventional time related data item relating to the time zone
20 in which he is situated.

 The decimal system further constitutes an advantageous alternative to the H-M-S system conventionally used since it allows the inherent conversion problems of the H-M-S system to be avoided. This alternative is moreover more logical and comprehensible for the user who is already accustomed to the decimal system.

 In order to form a time related data item based on the H-M-S system, electronic timepieces commonly include a time base, typically a quartz oscillator supplying pulses at a determined frequency equivalent to a binary power, for example 32,768 Hz. A frequency divider circuit, formed of a succession of N binary division stages (flip-flops) connected in cascade, is coupled to the time base so as to supply

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> 25

control pulses whose frequency is reduced by a factor 2^N . Typically, this frequency divider circuit is formed of $N=15$ binary division stages, so that the frequency of the pulses supplied by the time base is reduced to 1 Hz. In electronic timepieces allowing the display of several distinct time related data, these control pulses are thus used to

5 control the respective displays of these time related data.

In order to form the second time related data item based on the selected decimal system, it is a priori possible to periodically perform an arithmetical conversion operation on a conventional time related data item based on the H-M-S system. This trivial solution consists, in other words, in providing conversion or calculating means

10 dedicated to this task. It will be noted however that this solution is not suitable for use in a timepiece since it will preferably be sought to provide means allowing control pulses, which allow the second time related data item based on the decimal system to be formed and displayed, to be generated directly.

In order to generate control pulses allowing a time related data item based on

15 the decimal system to be formed in which the time is divided at least into thousandths of a day, it is necessary to generate such pulses at least at a frequency of 1/86.4 Hz or a decimal multiple of this frequency, i.e. 1/8.64 Hz for a division into ten-thousandths of a day, 1/0.864 Hz for a division into a hundred-thousandths of a day, etc.. In practice, one will choose to generate the second control pulses either at a

20 frequency of 1/86.4 Hz or at a frequency of 1/8.64 Hz, higher frequencies being however able to be chosen as required.

A trivial solution to this problem consists in providing an additional time base allowing pulses to be supplied at a specific frequency corresponding to a multiple of the desired frequency, for example 10,000 Hz. A frequency divider circuit having for

25 example a division ratio equivalent to 86,400 would thus allow control pulses to be generated at a frequency of 1/8.64 Hz. This trivial solution thus involves the use of two distinct division chains (time base + frequency divider circuit) to display the first and second time related data items. It will however be sought to limit the number of components necessary to generate the control pulses and in particular to use only one

time base, and preferably a horological time base, i.e. a time base supplying pulses at a frequency equivalent to a binary power.

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According to the present invention, the timepiece is advantageously arranged to derive the control pulses of the first and second time related data items from the same time base. It includes for this purpose generating means arranged to supply, from auxiliary control pulses originating from the time base, the second control pulses allowing the second time related data item to be formed and displayed. The timepiece can thus be arranged in particular to derive, from pulses at 1 Hz originating from the time base at the output of the frequency divider circuit, second control pulses having a frequency of 1/86.4 Hz in order to form a second time related data item to a thousandth of a day, despite the fact that the division ratio of these frequencies is not integer.

Another advantage of the present invention thus lies in the fact that only one time base is used to generate the different control pulses of the first and second time related data items and that it is consequently possible to adapt the electronic system of a conventional timepiece so that it allows the display of a time related data item based on the decimal system.

Other features and advantages of the present invention will appear upon reading the following detailed description, made with reference to the annexed drawings given solely by way of example and in which:

- Figure 1 shows a simplified block diagram of a timepiece constituting a first embodiment of the present invention;
- Figure 2 shows a simplified block diagram of a timepiece constituting a second embodiment of the present invention;
- Figures 3a and 3b show plane view of timepieces according to the present invention illustrating different possibilities for the display of the time related data;
- Figure 4 shows a flow chart of the implementation of a first alternative embodiment of the generating means allowing control pulses to be supplied for the display of the time related data item based on the decimal system;
- Figure 5 shows a second alternative embodiment of the generating means allowing control pulses to be supplied for the display of the time related data item based on the decimal system;